



HP Caliper HP's Performance Analysis Tool

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Agenda

- Quick overview of Caliper
- New features in Caliper
 - traps – sampled traps profile in Montecito
 - cstack – sampled call stack profile (coming soon on Linux)
 - dcache – bucketization of data miss latencies
- Quick overview of GUI
- New GUI features
 - Viewer for sampled traps and bucketed miss latencies
 - Call stack graph/call graph (coming soon on Linux)
 - Top-level views of load modules, processes, executables
 - Merging and differencing data

Quick overview of Caliper

- Performance measurement & analysis tool
 - Linux and HP-UX
 - Measures any Itanium native code w/o special builds
- Many different measurements
 - Uses Performance Monitor Unit (PMU) hardware
- System wide and per-task (follow processes)
- Ability to drill down from system wide data
 - processes, load modules, functions, source lines and assembly instructions
- Graphical and command-line interfaces

traps – traps, interrupts and faults profile

- Samples Montecito ETB to capture traps
caliper traps [-w] or [program ...]
- Collects & reports all 34 traps, interrupts and faults
 - Reports: tlb miss, unaligned data ref and FP faults/traps
- Provides summary and detail instruction level data
- Profiles can be sorted on any reported trap type

cstack – call stack profile

- Time sampled call stack profile
caliper cstack program ...
- Helps locate where the program is waiting for system calls, locks or I/O
- Produces a flat profile based on sample hits in blocked and running threads
- Reports hot call paths
- Advanced GUI features to visualize hot call paths

dcache – bucketized dmiss latencies

- Average & total latency is not sufficient
 - memory system is more complex on cell based systems
 - data distribution/affinity has big impact on performance
- Need detailed breakdown of access latencies across the memory hierarchy
- Expands average latency into 8 latency buckets
 - L2, L3, local c2c, cell local memory etc.,
 - summary and detailed instruction level data
- Uses expected system latency
 - based on chipset type, CPU type & frequency

Quick overview of GUI

- An Eclipse RCP application
- Makes it easy to:
 - Perform measurement collections
 - Browse Caliper databases
 - See measurement data, with easy drill down
- Can be run on remote Integrity server, with display shown on your desktop X server (not recommended on wide-area network) via:

```
$ caliper -g
```

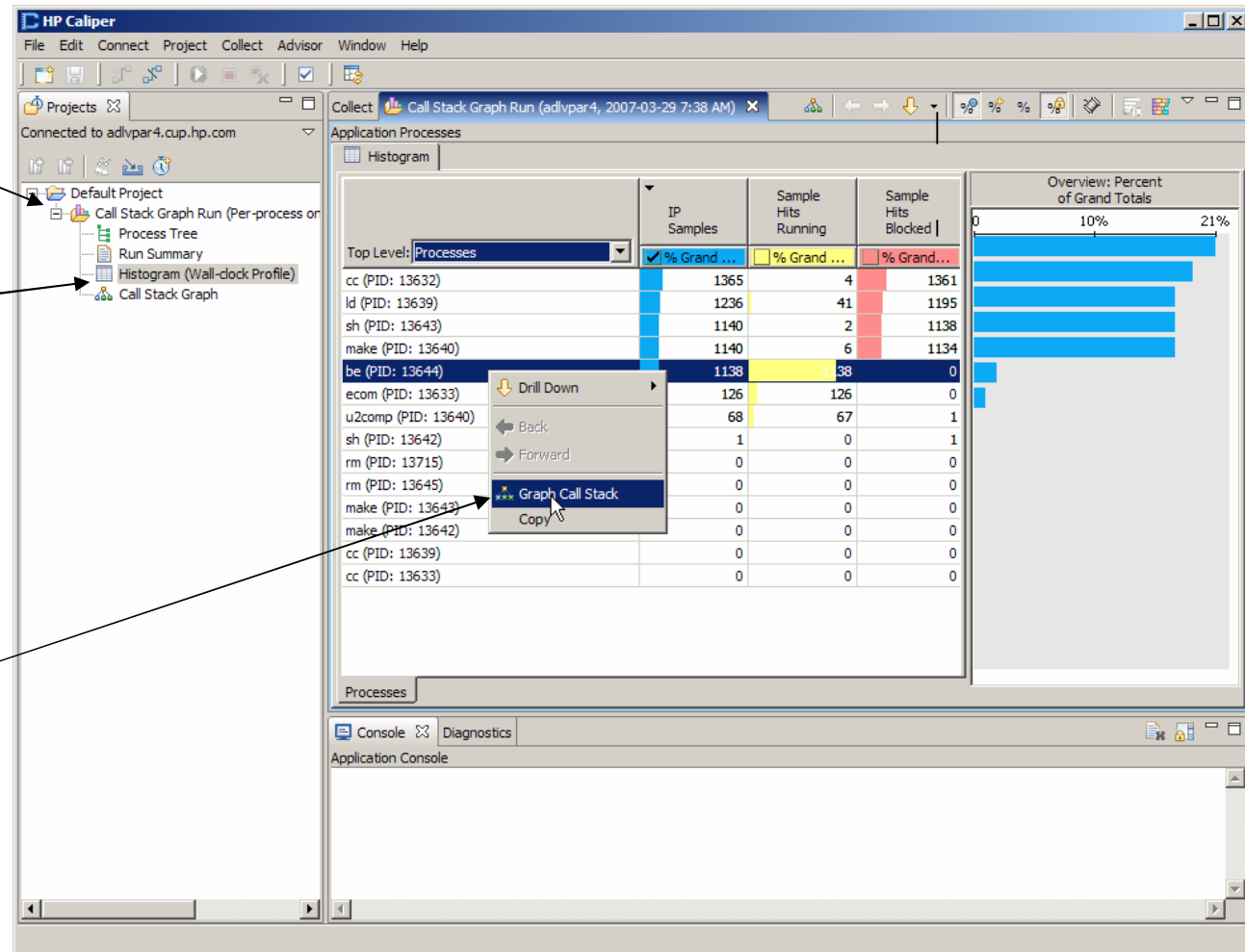
- Can be run locally on a Windows or Linux x86-based system (local GUI client communicates with Caliper server via **ssh** or **rexec**)

Choosing a process to graph

Previously collected data

View process histogram

Graph process be's call stack samples



Call stack graph

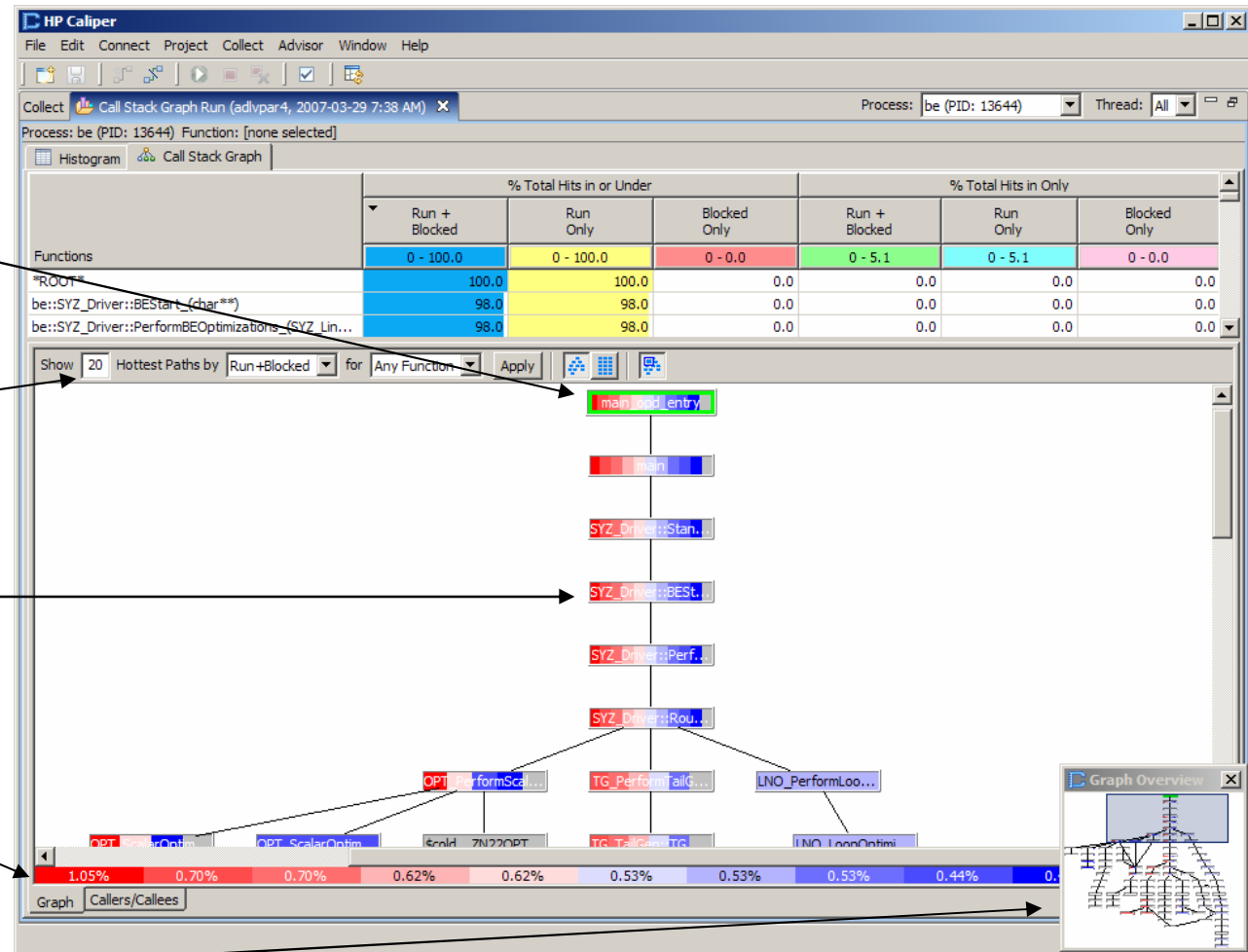
Roots highlighted in green

Maximum paths

Node colored for each path it's member of

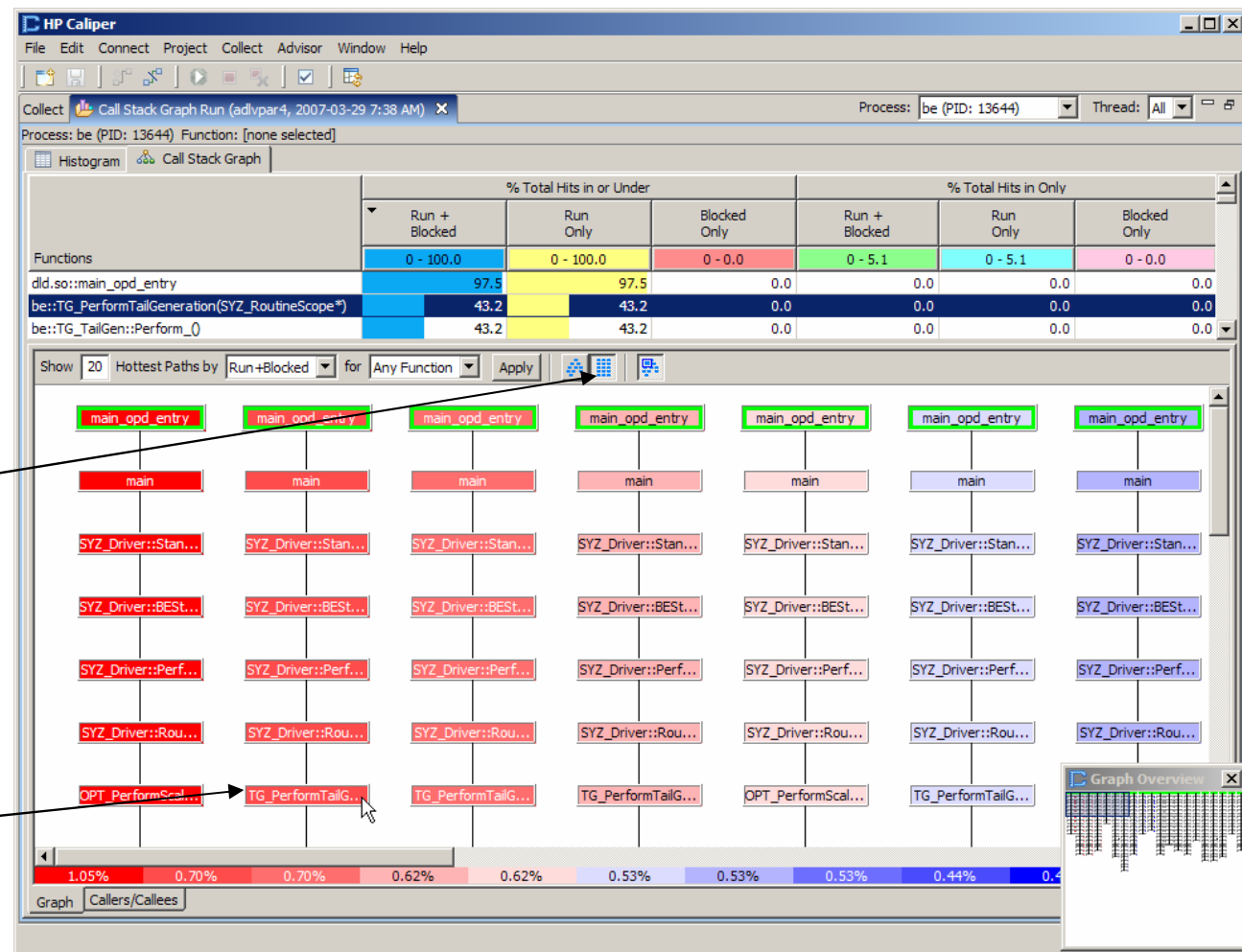
Legend

Overview and Scroller



Note: Run/block breakdown not available on Linux (but can be inferred)

Viewing hot paths separately



Show paths separately

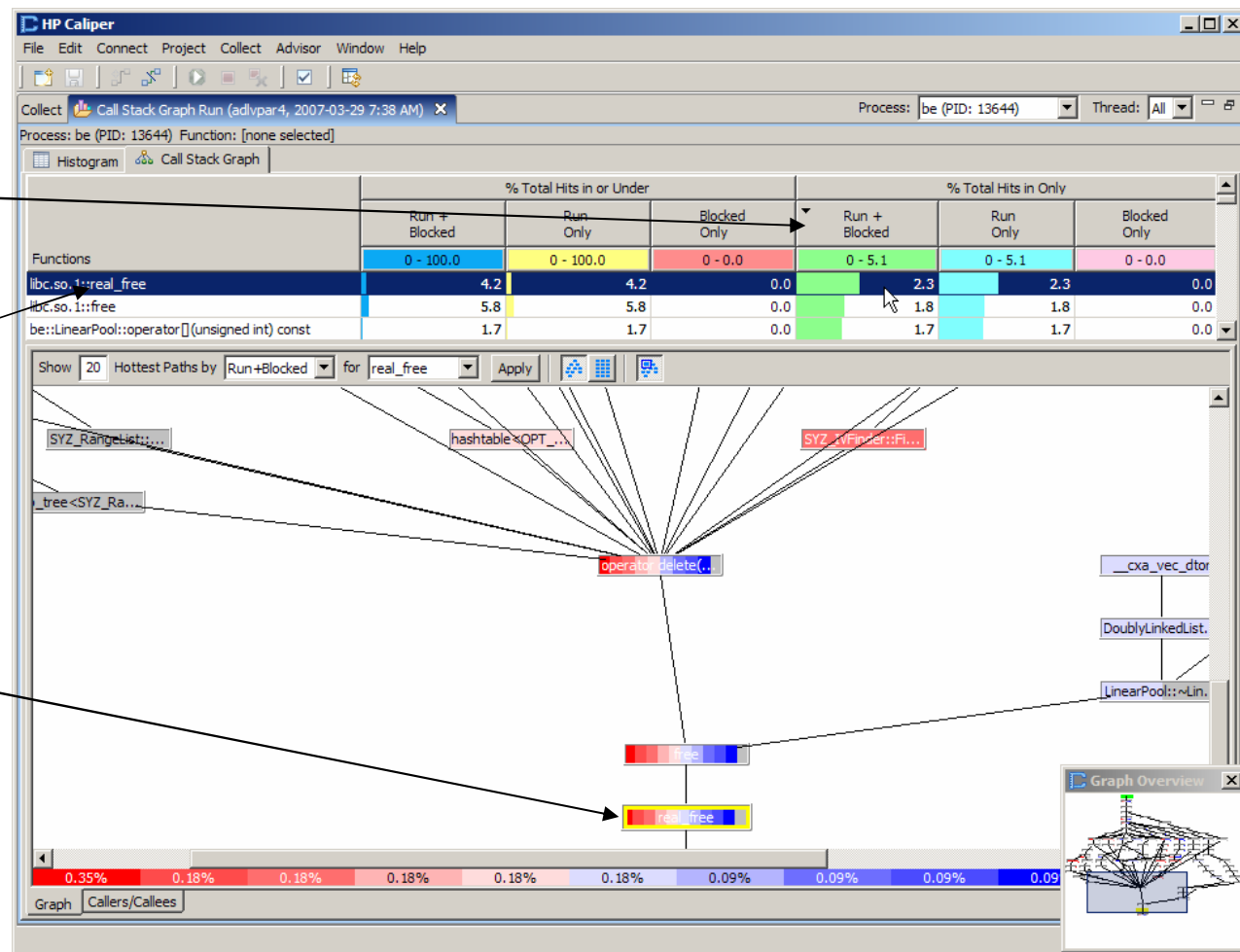
Double-click node to see entry in table

Graphing a particular function

Sort on hits in only

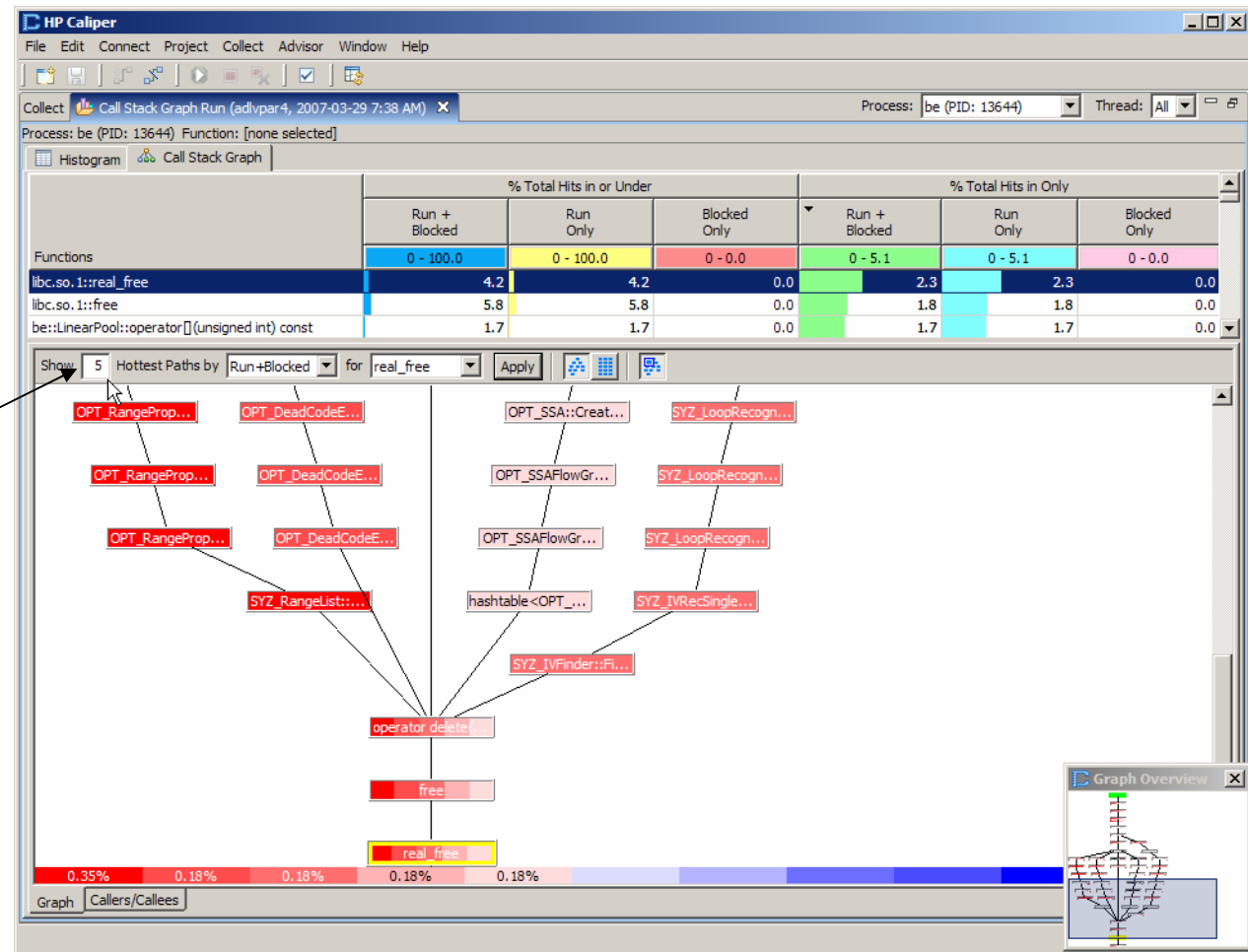
Double-click hot function

Graphed function highlighted in yellow



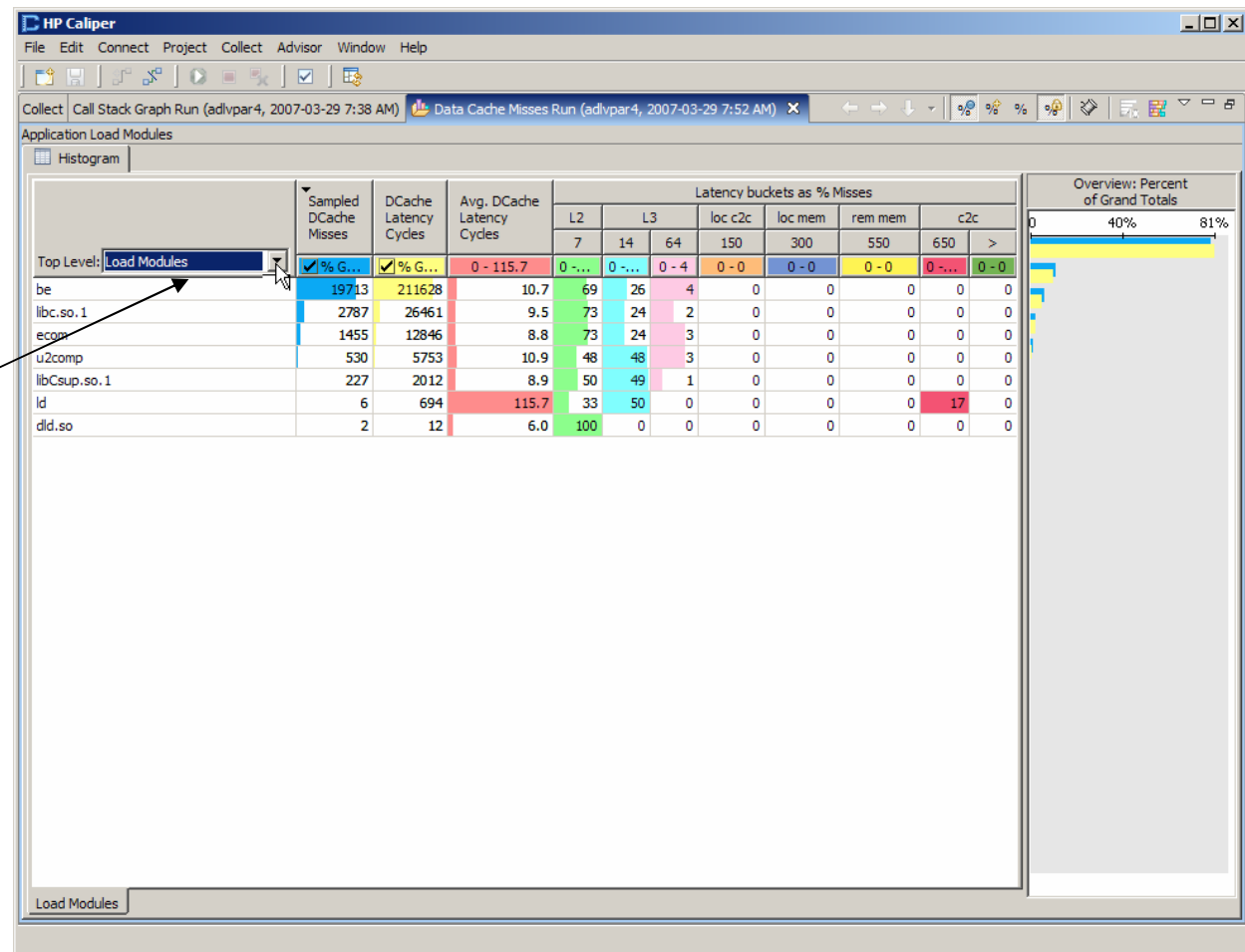
Simplifying the graph

Show 5 hottest paths that include selected function



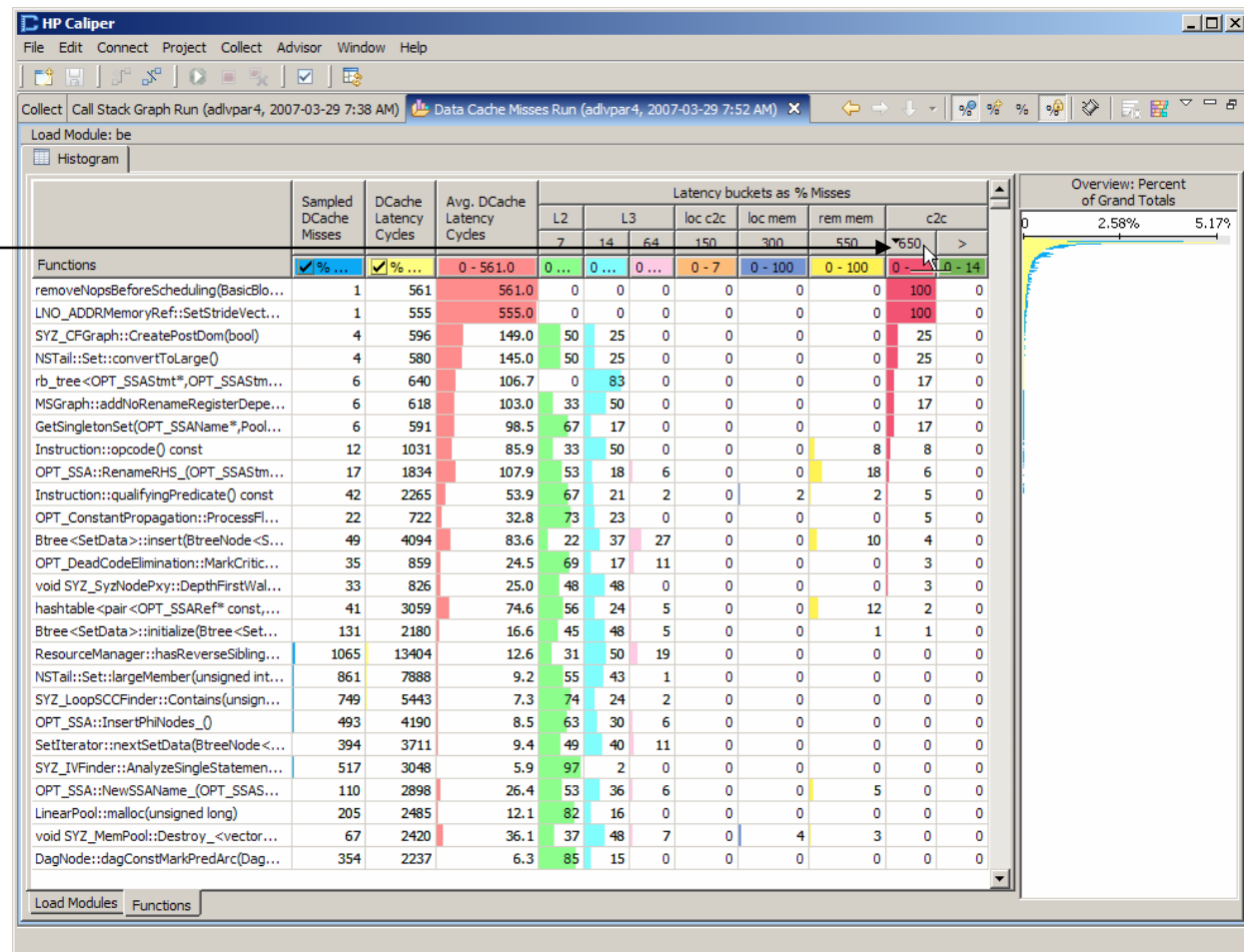
Data cache miss buckets

Group data by process, executable, or load module, then drill down



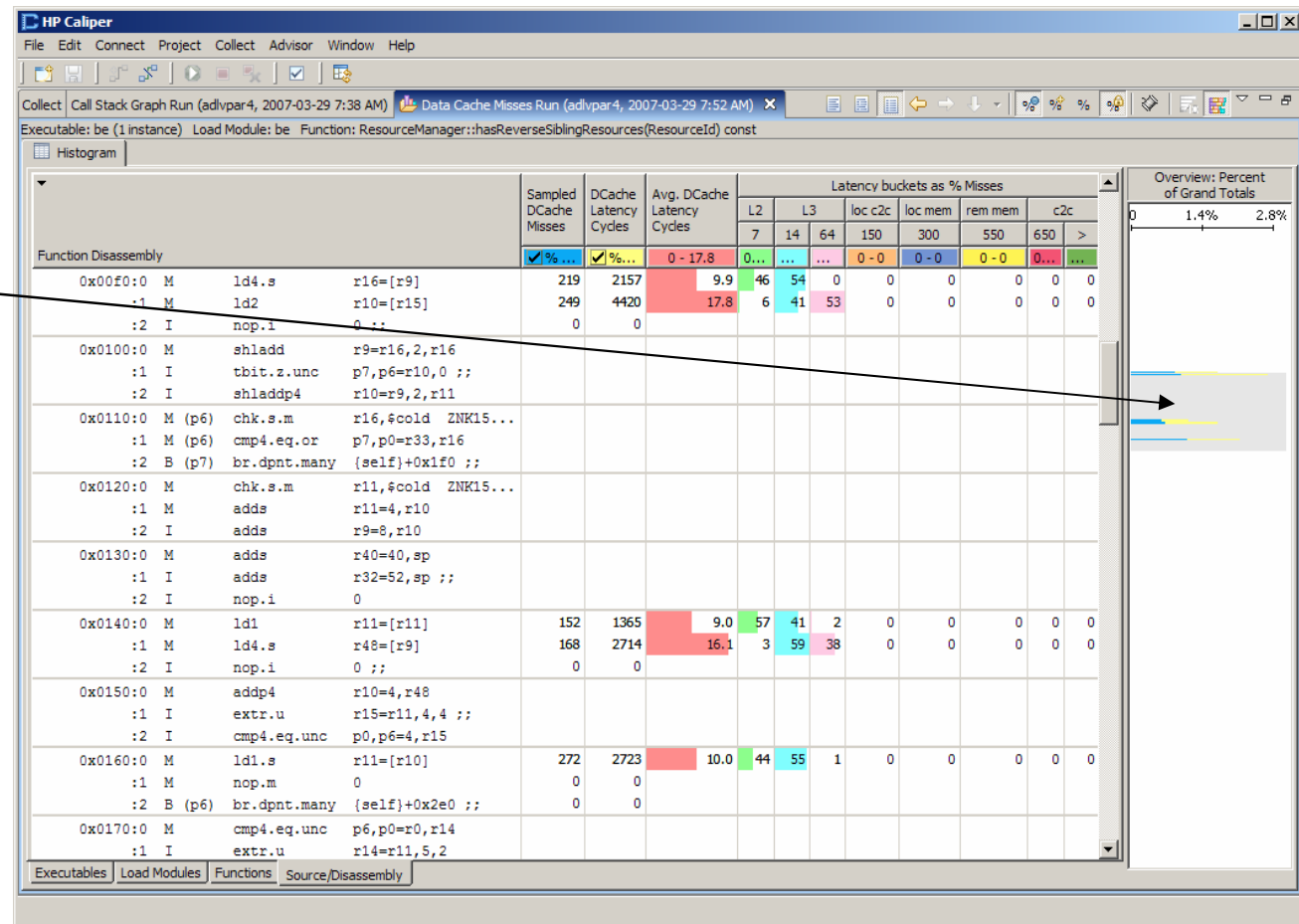
Data cache misses by function

Sort functions
on any bucket



Data cache misses by instruction

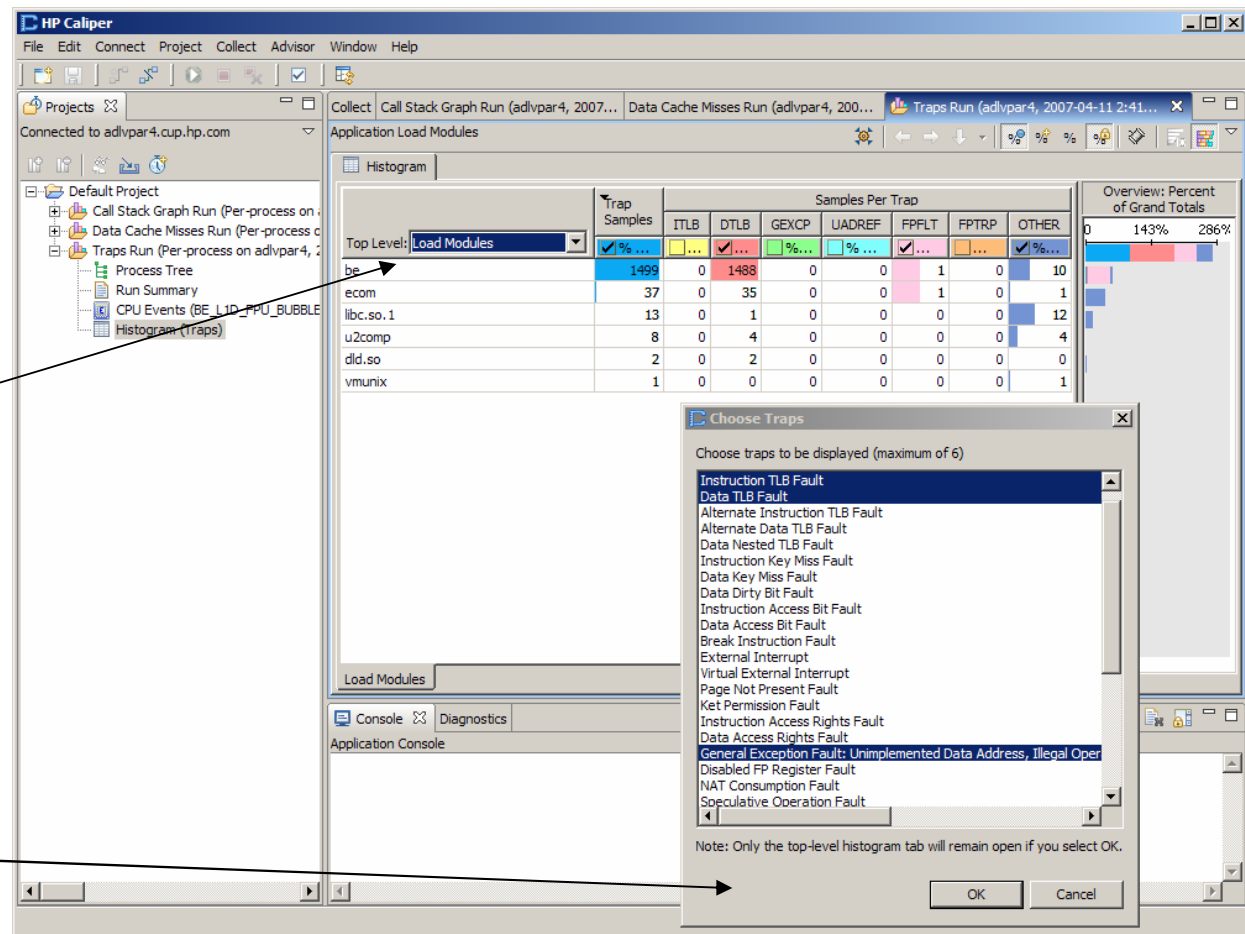
Click overview
to scroll to hot
spots



Viewing trap profile

Show traps by load module

Choose traps of interest



The screenshot shows the HP Caliper interface with the 'Traps Run' histogram selected. The 'Top Level' is set to 'Load Modules'. The histogram table displays the following data:

Trap	Samples	ITLB	DTLB	GEXCP	UADREF	FPFLT	FPTRP	OTHER
be	1499	0	1488	0	0	1	0	10
ecom	37	0	35	0	0	1	0	1
libc.so.1	13	0	1	0	0	0	0	12
u2comp	8	0	4	0	0	0	0	4
dld.so	2	0	2	0	0	0	0	0
vmunix	1	0	0	0	0	0	0	1

The 'Choose Traps' dialog box is open, showing a list of traps to be displayed (maximum of 6). The selected traps are:

- Instruction TLB Fault
- Data TLB Fault
- Alternate Instruction TLB Fault
- Alternate Data TLB Fault
- Data Nested TLB Fault
- Instruction Key Miss Fault
- Data Key Miss Fault
- Data Dirty Bit Fault
- Instruction Access Bit Fault
- Data Access Bit Fault
- Break Instruction Fault
- External Interrupt
- Virtual External Interrupt
- Page Not Present Fault
- Ket Permission Fault
- Instruction Access Rights Fault
- Data Access Rights Fault
- General Exception Fault: Unimplemented Data Address, Illegal Oper
- Disabled FP Register Fault
- NAT Consumption Fault
- Speculative Operation Fault

Note: Only the top-level histogram tab will remain open if you select OK.

Easy merging/differencing of data

HP Caliper

File Edit Connect Project Collect Advisor Window Help

Collect

Call Stack Graph Run (adlpar4, 2007-03-29 7:38 AM)

Data Cache Misses Run (adlpar4, 2007-03-29 7:52 AM)

Traps Run (adlpar4, 2007-04-11 2:41 PM)

Merged Runs (2007-04-11 5:44 PM)

Application Executables

Histogram

Top Level: Executables	Sampled DCache Misses	DCache Latency Cycles	Avg. DCache Latency Cycles	Latency buckets as % Misses								Trap Samples	Samples Per Trap						Overview: Percent of Grand Totals
				L2		L3		loc c2c	loc mem	rem mem	c2c		ITLB	DTLB	GEXCP	UADREF	FPFLT	FPTRP	
				7	14	64	150	300	550	650	>								
be (2 instances)	22359	236114	10.6	69	26	4	0	0	0	0	0	1512	0	1488	0	0	1	0	
ecom (2 instances)	1726	15770	9.1	71	25	3	0	0	0	0	0	38	0	36	0	0	1	0	
u2comp (2 instances)	626	6767	10.8	54	43	3	0	0	0	0	0	9	0	5	0	0	0	0	
ld (2 instances)	9	755	83.9	44	33	11	0	0	0	11	0	1	0	1	0	0	0	0	
cc (6 instances)	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
make (6 instances)	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
rm (4 instances)	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
sh (4 instances)	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

0164%328%

Executables

Resources

- caliper-help@cup.hp.com
 - Caliper “help” mailing list
 - All Caliper questions, bug reports, enhancement requests
- <http://hp.com/go/caliper>
 - Caliper external website
 - Downloads, documentation, tech notes
- <http://devresource.hp.com>
 - Developers resources website
 - Training webinars